

THE GROWING INTEREST IN SPACE TRAVEL

Fifth International Astronautical Congress
Innsbruck, Austria, August 1-7, 1954

Thirty years ago at a meeting of the Deutsche Naturforscher - und Arztag in Innsbruck, Professor Hermann Oberth discussed the possibility of space travel and the technical problems as he saw them amid the laughter of his scientific colleagues, who believed that escape of a vehicle from the earth was an idle dream. This year in the same city there was held the Fifth International Astronautical Congress at which Professor Oberth presented a paper on the design of pressure suits for use in free space. This time the astronautical pioneer was heard with respect.

In the thirty-year period there have been many scientific and technical developments which have advanced the dream of space travel to a vision whose realization seems nearer if not immediately at hand. The program of the Congress itself is the best illustration of the change in attitude of at least some scientists. Visiting aeronautical engineers were surprised to find many papers dealing with problems of immediate interest to them.

Thirty-two papers were read by contributors: from the United States (8), Germany (7), Austria (4), Great Britain, France, Holland, Egypt, Argentina (2 each), Canada, Italy, and Switzerland (1 each). Fourteen of the papers were wholly astronautical in character, while eighteen dealt with problems which are now or will in the near future be of concern in airplanes and guided missiles. Printed preprints of 20, mimeographed texts of 4, and abstracts of 3 of the papers were available at the meeting.

Of the wholly astronautical papers, two dealt with analysis of orbital systems and methods of proceeding from an orbit around the earth to an orbit around a planet, one with the automatic steering of step rockets in space, one with analogue computations of satellite orbits, one with the thermal dissipation of meteorites by bumper screens, one already referred to with the design of space suits, and two with ionic propulsion of space vehicles in regions distant from gravitational fields. The use of ions as a working medium for rockets was shown to be economical in fuel but the realizable thrusts are small. Nevertheless, accelerations of several orders of ten lower than gravity at the earth's surface ($4 \times 10^{-5}g$) give large velocities and distances in free space when continued over long periods (10 km/sec and 10^8 kilometers at the end of 1 year for a 250-ton ship).

Six of the astronautical papers were of miscellaneous character. F. I. Ordway, a U. S. student at the University of Paris formerly with Reaction Motors, spoke on "The Respectability of Astronautics as Reflected by Recent Developments in the United States," the paper being prepared in collaboration with H. E. Canney, Jr., of Bell Aircraft. I. M. Levitt, Director of the Fels Planetarium, Philadelphia, discussed the geodetic significance of a minimum satellite vehicle. A paper prepared by A. J. Zähringer on solid propellants and astronautics was read. Other papers dealt with the legal problems of free space, ideographs suitable for communication with inhabitants of other planets and with possible activities of the International Astronautical Federation. Probably aeronautical engineers will find little of direct interest to their work in these purely astronautical papers.

The remaining 18 papers are of substantially different character. Seven of them dealt with rocket trajectories. H. J. Káppler and M. E. Kübler discussed the return of winged vehicles from outer space stations. Much of this paper dealt with effects of air resistance at very high altitudes on satellite vehicles and with re-entry trajectories. There was no experimental material and the assumptions were relatively crude. The object was a general view of the problem.

Other papers treated the calculation of step rockets, optional programming of rocket thrust direction, measurement of rocket trajectories, the French program for exploration of the upper atmosphere by the rocket "Veronica," during the International Geophysical Year, and approximate computations of the aerodynamic heating of conical bodies at extremely high Mach numbers.

Four papers on combustion were presented. F. Cap of Innsbruck formulated the theoretical equations for flows in which combustion occurs and outlined methods for their solution. U. T. Bédewalt, of Egypt, discussed the influence of recombination on the efficiency of liquid-fuel rockets. A paper was read for E. Sängér on stationary nuclear combustion in rockets, and one by Irene Sängér-Bredt on the investigation of initial steps in combustion processes. Unfortunately both authors were prevented from attending by the official opening under Sängér's direction of an Institute for Physics of Jet Propulsion at Stuttgart. The paper by Sängér-Bredt was particularly stimulating. It contrasted nuclear production of heat in which the laws of the microscopic processes were derived from knowledge of the interactions between individual nuclei and chemical combustion in which the elementary reactions are not understood physically. Sängér-Bredt proposes that the technique of crossed molecular beams in vacuo be applied to study the elementary processes. Her paper reviews presently available experimental methods for studying combustion processes and some of the past work on molecular beams.

A paper by H. H. Kolle of Stuttgart describes computations of the influence of turbopump design on the flight performance of large rockets.

Two papers dealt with cosmic ray hazards, one by H. J. Schaefer of the U. S. Naval School of Aviation Medicine, and one by J. Eugster of Berne. Eugster described a technique of exposing a sample of tissue to cosmic rays in the stratosphere and reinstalling the tissue in the living organism to follow changes in cell structure in its natural environment.

There were two contributions on high temperature materials. One was by R. Kieffer and F. Benesovsky of the Metallwerk Plansee, Reutte, Tyrol, a leading exponent of powder metallurgy techniques, on high temperature sintered materials. He described some of the company's WZ alloys, alloys of Ti C, Ni, Cr, and Co. He also referred to experimental work on MoSi_2 , pieces of which have been heated up to 1700°C without scaling, but the material is too brittle for turbine blades.

The second paper on high temperature materials by E. Fitzer of Vienna was a summary type paper on the development of high temperature materials. The paper describes a recent development by the author of a protecting coating for Mo and W. It depends on the production of a surface layer of MoSi_2 by the catalytic reduction of silica chloride by hydrogen (Austrian Patent 178779). Protection for 300 hours at 1600°C has been obtained.

A paper by H. Strughold pointed out that many of the physiological problems to be encountered in space travel were already to be encountered in stratospheric flight, such as gravity-free trajectories, cosmic rays, low pressure, etc. The final paper by the pioneer astronaut, G. von Pisquet, dealt with nomenclature questions for step rockets.

The Congress was held under the sponsorship of the International Astronautical Federation, a federation of astronautical, interplanetary, and rocket societies in 18 countries: Argentina, Austria, Denmark, France, Germany, Great Britain, Italy, Yugoslavia, Netherlands, Norway, South Africa, Spain, Sweden, Switzerland, United States, and, represented for the first time at this meeting, Egypt, Japan, and Brazil. Member societies from the United States are the American Rocket Society, Chicago Rocket Society, Detroit Rocket Society, Pacific Rocket Society, Reaction Research Society, and Philadelphia Astronautical Society. The official U. S. delegation was headed by Andrew G. Haley, President of the American Rocket Society.

At the business meeting of the Federation, Frederick C. Durant (U.S.A.) was reelected president and Joseph Stemmer (Switzerland) was reelected secretary. E. Buch-Anderson (Denmark) was elected 1st vice president, and Teofilo Tabanera (Argentina) 2nd vice president.

It was decided to establish a new publication, "Acta Astronautica," under the sponsorship of the Federation. The publisher will be Springer.

The Sixth Astronautical Congress will be held in Copenhagen, July 21-27, 1955.